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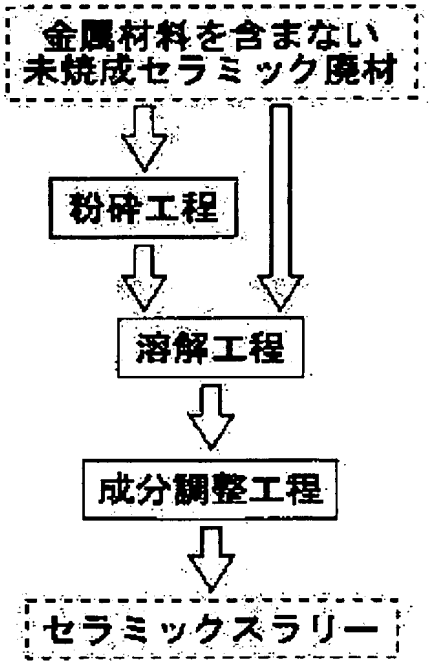
(54) RECLAIMED CERAMIC SLURRY AND ITS PRODUCTION METHOD, RECLAIMED CERAMIC POWDER AND ITS PRODUCTION METHOD, AND CERAMIC ELECTRONIC PART AND ITS PRODUCTION METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a reclaimed ceramic slurry capable of contributing to the reduction of the cost required for waste disposal, and to the reduction of the cost for producing ceramic electronic parts.
SOLUTION: When obtaining the reclaimed ceramic slurry from unburned ceramic wastes containing no metal, the unburned ceramic wastes are first dissolved in solvent (dissolution step), and then after the dissolution step, the components of the waste solution are adjusted (component adjusting step). Although the waste solution already contains ceramic particles, binders, plasticizers, dispersants and solvents, the materials other than the ceramic particles are added to adjust the components so that each component has each predetermined concentration.



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CLAIMS

[Claim(s)]
[Claim 1] The playback ceramic slurry characterized by what the non-calcinated ceramic scrap wood which does not contain a metallic material was dissolved with the solvent, and was generated by adjusting the component of a scrap wood solution.
[Claim 2] The manufacture approach of the playback ceramic slurry characterized by what it has for the process which dissolves with a solvent the non-calcinated ceramic scrap wood which does not contain a metallic material, and the process which adjusts the component of a scrap wood solution and generates a ceramic slurry.
[Claim 3] The playback ceramic slurry characterized by what was generated by adjusting the component of the scrap wood solution from which the non-calcinated ceramic scrap wood containing a metallic material was dissolved with the solvent, the metal was removed from the scrap wood solution, and the metal was removed.
[Claim 4] The manufacture approach of the playback ceramic slurry characterized by what it has for the process which dissolves the non-calcinated ceramic scrap wood containing a metallic material with a solvent, the process which removes a metal from a scrap wood solution, and the process which adjusts the component of the scrap wood solution from which the metal was removed, and generates a ceramic slurry.
[Claim 5] Playback ceramic powder characterized by what was generated by carrying out disintegration of the scrap wood solution from which the non-calcinated ceramic scrap wood which does not contain a metallic material was dissolved with the solvent, the binder was removed from the scrap wood solution, and the binder was removed.
[Claim 6] The manufacture approach of the playback ceramic powder characterized by what it has for the process which dissolves with a solvent the non-calcinated ceramic scrap wood which does not contain a metallic material, the process which removes a binder from a scrap wood solution, and the process which carries out disintegration of the scrap wood solution from which the binder was removed, and generates ceramic powder.
[Claim 7] Playback ceramic powder characterized by what was generated by carrying out disintegration of the non-calcinated ceramic scrap wood from which the binder was removed from the non-calcinated ceramic scrap wood which does not contain a metallic material, and the binder was removed.
[Claim 8] The manufacture approach of the playback ceramic powder characterized by what it has for the process which removes a binder from the non-calcinated ceramic scrap wood which does not contain a metallic material, and the process which carries out disintegration of the non-calcinated ceramic scrap wood from which the binder was removed, and generates ceramic powder.
[Claim 9] Playback ceramic powder characterized by what was generated by carrying out disintegration of the scrap wood solution from which the non-calcinated ceramic scrap wood containing a metallic material was dissolved with the solvent, the metal was removed from the scrap wood solution, the binder was removed from the scrap wood solution, and the metal and the binder were removed.
[Claim 10] The manufacture approach of the playback ceramic powder characterized by what it has for the process which dissolves the non-calcinated ceramic scrap wood containing a metallic material with a solvent, the process which removes a metal from a scrap wood solution, the process which removes a binder from a scrap wood solution, and the process which carries out disintegration of the scrap wood solution from which the metal and the binder were removed, and generates ceramic powder.
[Claim 11] Ceramic electronic parts characterized by what was manufactured using the ceramic slurry which reproduced and obtained non-calcinated ceramic scrap wood [claim 12] The manufacture approach of the ceramic electronic parts characterized by what it has for the process which forms a green sheet using the

ceramic slurry which reproduced and obtained non-calcinated ceramic scrap wood.
[Claim 13] A ceramic slurry is the manufacture approach of the ceramic electronic parts according to claim 12 characterized by what the non-calcinated ceramic scrap wood which does not contain a metallic material is dissolved with a solvent, and is generated by adjusting the component of a scrap wood solution.
[Claim 14] A ceramic slurry is the manufacture approach of the ceramic electronic parts according to claim 12 characterized by what is generated by adjusting the component of the scrap wood solution from which the non-calcinated ceramic scrap wood containing a metallic material was dissolved with the solvent, the metal was removed from the scrap wood solution, and the metal was removed.
[Claim 15] Ceramic electronic parts characterized by what was manufactured using the ceramic powder which reproduced and obtained non-calcinated ceramic scrap wood [claim 16] The manufacture approach of the ceramic electronic parts characterized by what it has for the process which forms a ceramic slurry using the ceramic powder which reproduced and obtained non-calcinated ceramic scrap wood, and the process which forms a green sheet using this ceramic slurry.
[Claim 17] Ceramic powder is the manufacture approach of the ceramic electronic parts according to claim 16 characterized by what is generated by carrying out disintegration of the scrap wood solution from which the non-calcinated ceramic scrap wood which does not contain a metallic material was dissolved with the solvent, the binder was removed from the scrap wood solution, and the binder was removed.
[Claim 18] Ceramic powder is the manufacture approach of the ceramic electronic parts according to claim 16 characterized by what is generated by carrying out disintegration of the non-calcinated ceramic scrap wood from which the binder was removed from the non-calcinated ceramic scrap wood which does not contain a metallic material, and the binder was removed.
[Claim 19] Ceramic powder is the manufacture approach of the ceramic electronic parts according to claim 16 characterized by what is generated by carrying out disintegration of the scrap wood solution from which the non-calcinated ceramic scrap wood containing a metallic material was dissolved with the solvent, the metal was removed from the scrap wood solution, the binder was removed from the scrap wood solution, and the metal and the binder were removed.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to a playback ceramic slurry and its manufacture approach, playback ceramic powder and its manufacture approach, and ceramic electronic parts and its manufacture approach.
[0002]
[Description of the Prior Art] There are a coincidence baking type thing and a non-coincidence baking type thing in the stacked type ceramic condenser known as one of the ceramic electronic parts. A coincidence baking type thing The process which carries out coating of the ceramic slurry on a band-like film, and creates a green sheet, The process which prints conductive paste and forms the conductor layer for internal electrodes of a predetermined array on a green sheet, The process which pierces a green sheet with a unit dimension, carries out the laminating of this and sticks it by pressure, The process which divides a sticking-by-pressure sheet to a chip size with equipments, such as a dicer and a slicer, The process which removes a binder from each sheep baking chip, the process which applies conductive paste to the front face of each sheep baking chip, and forms the conductor layer for external electrodes in it, It is manufactured through the process which calcinates each sheep baking chip together with the non-calcinated conductor layer for internal electrodes, and the non-calcinated conductor layer for external electrodes, and the process which forms one or more deposits in the front face of an external electrode. Moreover, after it calcinates each sheep baking chip together with the non-calcinated conductor layer for internal electrodes after said debinder process, a non-coincidence baking type thing applies conductive paste to the front face of each baking chip, forms the conductor layer for external electrodes, calcinates this and forms the external electrode.
[0003]
[Problem(s) to be Solved by the Invention] Various non-calcinated ceramic scrap wood is generated in the process in which a laminating ceramic condenser is manufactured as stated previously. For example, in the aforementioned green sheet formation process, the green sheet which produced defects poor thickness, a poor consistency, wrinkling survival, with a pinhole, etc. serves as non-calcinated ceramic scrap wood. Moreover, at the aforementioned laminating and sticking-by-pressure process, while the green sheet wreckage after a punch serves as non-calcinated ceramic scrap wood, the sticking-by-pressure sheet which produced the defect of a poor laminating and poor sticking by pressure serves as non-calcinated ceramic scrap wood. Furthermore, at the aforementioned fragmentation process, while the non-calcinated chip which produced a wrong cut's etc. defect serves as non-calcinated ceramic scrap wood, the sticking-by-pressure sheet wreckage and sludge (shavings) after a cut serve as non-calcinated ceramic scrap wood.
[0004] Of course, it is the same not only as a stacked type ceramic condenser but the above, or said same non-calcinated ceramic scrap wood is generated in the manufacture process also in the ceramic electronic parts of the other type manufactured using an approximate process.
[0005] Although the aforementioned non-calcinated ceramic scrap wood is disposed of proper in the responsibility by the side of manufacture, since the aforementioned non-calcinated ceramic scrap wood is increasing with the increment in need of the ceramic electronic parts in recent years, the cost burden which the disposal takes is very large, and serves as **** at the time of this cost burden aiming at reduction of a manufacturing cost. That is, if the non-calcinated ceramic scrap wood produced in the manufacture process of ceramic electronic parts is reproduced and it enables it to use, while the cost burden which the aforementioned scrap wood disposal takes is mitigable, reduction of the manufacturing cost of ceramic electronic parts etc. can be aimed at.

[0006] This invention was created in view of said situation, and the place made into the purpose is to offer the playback ceramic slurry which can contribute to mitigation of the cost burden which scrap wood disposal takes, reduction of the manufacturing cost of ceramic electronic parts, etc. and its manufacture approach, playback ceramic powder and its manufacture approach, and ceramic electronic parts and its manufacture approach.
[0007]
[Means for Solving the Problem] It is characterized by to be characterized by to be generated by the playback ceramic slurry which starts this invention in order to attain said purpose dissolving with a solvent the non-calcinated ceramic scrap wood which does not contain a metallic material, and adjusting the component of a scrap-wood solution, and to have the process which dissolves with a solvent the non-calcinated ceramic scrap wood with which the manufacture approach does not contain a metallic material, and the process which adjust the component of a scrap-wood solution and generate a ceramic slurry. This playback ceramic slurry can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts.
[0008] Moreover, the playback ceramic slurry concerning this invention Dissolve the non-calcinated ceramic scrap wood containing a metallic material with a solvent, and a metal is removed from a scrap wood solution. It is characterized by being generated by adjusting the component of the scrap wood solution from which the metal was removed. The manufacture approach It is characterized by having the process which dissolves the non-calcinated ceramic scrap wood containing a metallic material with a solvent, the process which removes a metal from a scrap wood solution, and the process which adjusts the component of the scrap wood solution from which the metal was removed, and generates a ceramic slurry. This playback ceramic slurry can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts.
[0009] On the other hand, the playback ceramic powder concerning this invention dissolves with a solvent the non-calcinated ceramic scrap wood which does not contain a metallic material. It is characterized by being generated by carrying out disintegration of the scrap wood solution from which the binder was removed from the scrap wood solution, and the binder was removed. The manufacture approach It is characterized by having the process which dissolves with a solvent the non-calcinated ceramic scrap wood which does not contain a metallic material, the process which removes a binder from a scrap wood solution, and the process which carries out disintegration of the scrap wood solution from which the binder was removed, and generates ceramic powder. This playback ceramic powder can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts.
[0010] Moreover, the playback ceramic powder concerning this invention removes a binder from the non-calcinated ceramic scrap wood which does not contain a metallic material. It is characterized by being generated by carrying out disintegration of the non-calcinated ceramic scrap wood from which the binder was removed. The manufacture approach It is characterized by having the process which removes a binder from the non-calcinated ceramic scrap wood which does not contain a metallic material, and the process which carries out disintegration of the non-calcinated ceramic scrap wood from which the binder was removed, and generates ceramic powder. This playback ceramic powder can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts.
[0011] Furthermore, the playback ceramic powder concerning this invention Dissolve the non-calcinated ceramic scrap wood containing a metallic material with a solvent, and a metal is removed from a scrap wood solution. It is characterized by being generated by carrying out disintegration of the scrap wood solution from which the binder was removed from the scrap wood solution, and the metal and the binder were removed. The manufacture approach The process which dissolves the non-calcinated ceramic scrap wood containing a metallic material with a solvent, It is characterized by having the process which removes a metal from a scrap wood solution, the process which removes a binder from a scrap wood solution, and the process which carries out disintegration of the scrap wood solution from which the metal and the binder were removed, and generates ceramic powder. This playback ceramic powder can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts.
[0012] On the other hand, it is characterized by manufacturing the ceramic electronic parts concerning this invention using the ceramic slurry which reproduced and obtained non-calcinated ceramic scrap wood, and the manufacture approach is characterized by having the process which forms a green sheet using the ceramic slurry which reproduced and obtained non-calcinated ceramic scrap wood. Since the non-calcinated ceramic scrap wood produced in the manufacture process of ceramic electronic parts can be reproduced and used, while the cost burden which scrap wood disposal takes is mitigable, reduction of the manufacturing

cost of ceramic electronic parts etc. can be aimed at.
[0013] Moreover, it is characterized by to manufacture the ceramic electronic parts concerning this invention using the ceramic powder which reproduced and obtained non-calcinated ceramic scrap wood, and that manufacture approach is characterized by to have the process which forms a ceramic slurry using the ceramic powder which reproduced and obtained non-calcinated ceramic scrap wood, and the process which forms a green sheet using this ceramic slurry. Since the non-calcinated ceramic scrap wood produced in the manufacture process of ceramic electronic parts can be reproduced and used, while the cost burden which scrap wood disposal takes is mitigable, reduction of the manufacturing cost of ceramic electronic parts etc. can be aimed at.
[0014] Said purpose, the other purpose, the configuration description, and the operation effectiveness of this invention become clear by the following explanation and the accompanying drawing.
[0015]
[Embodiment of the Invention] Various non-calcinated ceramic scrap wood is generated in the manufacture process of ceramic electronic parts, for example, the process which a laminating ceramic condenser which was described previously manufactures. For example, in the aforementioned green sheet formation process, the green sheet which produced defects poor thickness, a poor consistency, wrinkling survival, with a pinhole, etc. serves as non-calcinated ceramic scrap wood. Moreover, at the aforementioned laminating and sticking-by-pressure process, while the green sheet wreckage after a punch serves as non-calcinated ceramic scrap wood, the sticking-by-pressure sheet which produced the defect of a poor laminating and poor sticking by pressure serves as non-calcinated ceramic scrap wood. Furthermore, at the aforementioned fragmentation process, while the non-calcinated chip which produced a wrong cut's etc. defect serves as non-calcinated ceramic scrap wood, the sticking-by-pressure sheet wreckage and sludge (shavings) after a cut serve as non-calcinated ceramic scrap wood.
[0016] Although the thing containing a metallic material, i.e., non-calcinated the conductor layer for internal electrodes, the conductor layers for external electrodes, and these fragments, also exists in the aforementioned non-calcinated ceramic scrap wood, from non-calcinated ceramic scrap wood, it is possible to obtain the main component as a rework fundamentally irrespective of the existence of a metallic material.
[0017] According to the procedure which shows the procedure in the case of reproducing non-calcinated ceramic scrap wood, respectively, and is shown in drawing 1 , drawing 1 - drawing 4 can obtain a ceramic slurry from the non-calcinated ceramic scrap wood which does not contain a metallic material. Moreover, according to the procedure shown in drawing 2 , a ceramic slurry can be obtained from the non-calcinated ceramic scrap wood containing a metallic material, and it is also possible to obtain a metal in a process the middle.
[0018] It is also possible to be able to obtain ceramic powder from the non-calcinated ceramic scrap wood which does not contain a metallic material, and to obtain a binder in a process the middle on the other hand, according to the procedure shown in drawing 3 (A) or drawing 3 (B). Moreover, according to the procedure shown in drawing 4 , ceramic powder can be obtained from the non-calcinated ceramic scrap wood containing a metallic material, and it is also possible to obtain a metal and a binder in a process the middle.
[0019] Below, the regeneration procedure shown in each of drawing 1 - drawing 4 is concretely explained including a processor etc.
[0020] When obtaining a playback ceramic slurry from the non-calcinated ceramic scrap wood which does not contain a [regeneration procedure shown in drawing 1] metallic material, non-calcinated ceramic scrap wood is first dissolved with a solvent (dissolution process).
[0021] It is necessary to select the solvent used at this dissolution process proper according to the class of binder contained in non-calcinated ceramic scrap wood. For example, when a content binder is polyvinyl alcohol, one sort or two sorts or more of mixture, water, an alcoholic system, etc., is used as a solvent. Moreover, when a content binder is a polyvinyl butyral, one sort or two sorts or more of mixture, such as an alcoholic system, an aromatic hydrocarbon system, a ketone system, and an ester system, is used as a solvent. Furthermore, when a content binder is a polyethylene glycol, one sort or two sorts or more of mixture, such as water, an aliphatic series ketone system, an alcoholic system, and a glycol system, is used as a solvent. Furthermore, when a content binder is methyl cellulose, one sort or two sorts or more of mixture, such as water, an alcoholic system, a halogenated hydrocarbon system, an aromatic hydrocarbon system, and a carboxylic-acid system, is used as a solvent. Furthermore, when a content binder is a carboxymethyl cellulose, one sort or two sorts or more of mixture, water, a water organic solvent system, etc., is used as a solvent. Furthermore, when a content binder is ethyl cellulose, one sort or two sorts or more of mixture, such as an alcoholic system, an aromatic hydrocarbon system, a ketone system, an ester system,

and an alicyclic hydrocarbon system, is used as a solvent. Furthermore, when a content binder is hydroxypropylcellulose, one sort or two sorts or more of mixture, water, a lower alcohol system, etc., is used as a solvent. Furthermore, when a content binder is acrylic, one sort or two sorts or more of mixture, such as water, an alcoholic system, an aromatic hydrocarbon system, a ketone system, and an ester system, is used as a solvent. Furthermore, when a content binder is a polyurethane system, one sort or two sorts or more of mixture, such as water, an alcoholic system, an aromatic hydrocarbon system, a ketone system, and an ester system, is used as a solvent.

[0022] Drawing 5 (A) - drawing 5 (D) show an usable facility at this dissolution process, respectively.

[0023] The churning equipment 1 shown in drawing 5 (A) is equipped with container 1a and agitator 1b. This churning equipment 1 is suitable for dissolving comparatively elasticity green sheet scrap wood etc., and it throws in non-calcinated ceramic scrap wood gradually in a solvent on the occasion of the dissolution, rotating agitator 1b. As for the scrap wood solution WS at this time, it is desirable for solid content to serve as hyperviscosity more than at 50wt%, and it is [the peripheral velocity of agitator 1b] desirable to make it become 10 or more m/s. moreover, since solubility will fall if volatilization of a solvent increases and it is too low if the temperature of the scrap wood solution WS becomes high too much, the temperature of the scrap wood solution WS is maintained before and after 40 degrees C -- as -- suitable warming -- it is desirable to perform a temperature control with - cooler.

[0024] The kneading equipment 2 shown in drawing 5 (B) is equipped with container 2a and kneading-machine 2b. This kneading equipment 2 is suitable for dissolving comparatively hard sticking-by-pressure sheet scrap wood, non-calcinated chip scrap wood, etc., is kneaded throwing in non-calcinated ceramic scrap wood gradually in a very little solvent on the occasion of the dissolution rotating kneading-machine 2b, and makes the clay's lump. After kneading this lump further and considering as a uniform lump, it will agitate, if the solvent is added gradually and viscosity falls to some extent, kneading further. Since kneading will not fully be carried out if viscosity is low, it changes into a hyperviscous condition (conditions from which the load of kneading-machine 2b becomes max) as much as possible at the time of kneading initiation. When generation of heat accompanying kneading is remarkable, it cools if needed.

[0025] The ultrasonic distribution equipment 3 shown in drawing 5 (C) is equipped with container 3a, ultrasonic wave oscillator 3b, and agitator 3c. This ultrasonic distribution equipment 3 is suitable for dissolving comparatively elasticity green sheet scrap wood etc., and it throws in non-calcinated ceramic scrap wood gradually in a solvent on the occasion of the dissolution, impressing an electrical potential difference to ultrasonic wave oscillator 3b. If it seems that a lump cannot get loose easily, agitator 3c will be rotated. As for the scrap wood solution WS at this time, it is desirable for solid content to serve as hyperviscosity more than at 50wt%, and it is desirable to make it the full force force become [an output] more than 1000W, using the vibrator beyond 100W two or more as ultrasonic wave oscillator 3b. moreover, since solubility will fall if volatilization of a solvent increases and it is too low if the temperature of the scrap wood solution WS becomes high too much, the temperature of a scrap wood solution is maintained before and after 40 degrees C -- as -- suitable warming -- it is desirable to perform a temperature control with - cooler.

[0026] The media distribution equipment 4 shown in drawing 5 (D) is equipped with container 4a and disperser 4b. This media distribution equipment 4 is suitable for dissolving comparatively elasticity green sheet scrap wood etc., and it throws in non-calcinated ceramic scrap wood gradually in a solvent on the occasion of the dissolution, rotating disperser 4b. As for the scrap wood solution WS at this time, it is desirable for solid content to serve as hyperviscosity more than at 50wt%. moreover, since solubility will fall if volatilization of a solvent increases and it is too low if the temperature of a scrap wood solution becomes high too much, the temperature of the scrap wood solution WS is maintained before and after 40 degrees C -- as -- suitable warming -- it is desirable to perform a temperature control with - cooler.

[0027] In addition, in dissolving non-calcinated ceramic scrap wood, such as comparatively hard sticking-by-pressure sheet scrap wood and non-calcinated chip scrap wood, it grinds non-calcinated ceramic scrap wood if needed as a last process of a dissolution process (grinding process). The grinding equipment 5 which drawing 6 shows an usable facility at this grinding process, and was shown in drawing 6 is equipped with container 5a, agitator 5b, and grinding roller 5c. On the occasion of grinding, agitator 5b and grinding roller 5c are rotated, throwing in the non-calcinated ceramic scrap wood WA in container 5a, and grinding object WA' of the non-calcinated ceramic scrap wood WA is generated.

[0028] After a dissolution process performs the quality governing (quality-governing process) of a scrap wood solution next. Although a ceramic particle, the binder, the plasticizer, the dispersant, the solvent, etc. are already contained in the aforementioned scrap wood solution, a plasticizer and a dispersant, and the

thing that has the of the same kind or same effectiveness are added here. However, since the problem of the reinforcement of the green sheet created using a playback ceramic slurry falling will arise if the amount added in a scrap wood solution exceeds 1wt%, it is desirable to add by within the limits below 1wt%. Moreover, the component of the scrap wood solution used as a playback ceramic slurry is sampled during a quality governing, and it performs a quality governing so that the solid content concentration of a playback ceramic slurry may become within the limits which is 45 - 60wt%.

[0029] Drawing 7 (A) and drawing 7 (B) show an usable facility at this quality-governing process, respectively.

[0030] The concentration equipment 6 shown in drawing 7 (A) is equipped with container 6a, agitator 6b, and the reduced pressure pump of an illustration abbreviation. A need ingredient is thrown in considering as the condition under reduced pressure of the inside of container 6a, rotating agitator 6a in this condition on the occasion of a quality governing, and agitating the scrap wood solution WS in container 6a. since volatilization of a solvent will increase if the temperature of the scrap wood solution WS becomes high too much, the temperature of the scrap wood solution WS is maintained before and after 40 degrees C -- as -- suitable warming -- it is desirable to perform a temperature control with - cooler.

[0031] The churning equipment 7 shown in drawing 7 (B) is equipped with container 7a and agitator 7b. A need ingredient is thrown in rotating agitator 7b and agitating the scrap wood solution WS in container 7a on the occasion of a quality governing. since volatilization of a solvent will increase if the temperature of the scrap wood solution WS becomes high too much, the temperature of the scrap wood solution WS is maintained before and after 40 degrees C -- as -- suitable warming -- it is desirable to perform a temperature control with - cooler.

[0032] Above, a playback ceramic slurry can be obtained from the non-calcinated ceramic scrap wood which does not contain a metallic material.

[0033] This playback ceramic slurry can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts. for example, when manufacturing a coincidence baking type stacked type ceramic condenser Coating of the aforementioned playback ceramic slurry can be carried out on a band-like film, and a green sheet can be created. The process which prints conductive paste and forms the conductor layer for internal electrodes of a predetermined array on a green sheet as usual after this, The process which pierces a green sheet with a unit dimension, carries out the laminating of this and sticks it by pressure, The process which divides a sticking-by-pressure sheet to a chip size with equipments, such as a dicer and a slicer, The process which removes a binder from each sheep baking chip, the process which applies conductive paste to the front face of each sheep baking chip, and forms the conductor layer for external electrodes in it, The process which calcinates each sheep baking chip together with the non-calcinated conductor layer for internal electrodes and the non-calcinated conductor layer for external electrodes, and the process which forms one or more deposits in the front face of an external electrode can be carried out, and a stacked type ceramic condenser can be manufactured. Moreover, what is necessary is to apply conductive paste to the front face of each baking chip, to form the conductor layer for external electrodes, to calcinate this and just to form an external electrode, after calcinating each sheep baking chip together with the non-calcinated conductor layer for internal electrodes after said debinder process, when manufacturing a non-coincidence baking type stacked type ceramic condenser.

[0034] When obtaining a playback ceramic slurry from the non-calcinated ceramic scrap wood containing a [regeneration procedure shown in drawing 2] metallic material, first, non-calcinated ceramic scrap wood is dissolved with a solvent (dissolution process), and non-calcinated ceramic scrap wood is ground on the preceding paragraph story of a dissolution process if needed (grinding process). The contents of this dissolution process and the grinding process are the same as that of what was explained in the regeneration procedure of drawing 1 .

[0035] After a dissolution process performs metal removal (metal removal process) from a scrap wood solution next. Although a ceramic particle, metal particles, the binder, the plasticizer, the dispersant, the solvent, etc. are already contained in the aforementioned scrap wood solution, metal particles are mainly separated and removed from a scrap wood solution here.

[0036] Drawing 8 (A) - drawing 8 (E) show an usable facility at this metal removal process, respectively.

[0037] The magnetic-separation equipment 8 shown in drawing 8 (A) is equipped with container 8a and magnet 8b. This magnetic-separation equipment 8 is suitable when the metal which has magnetism is used, and it puts in the scrap wood solution WS in container 8a for metal removal, put it, the metal particles in the scrap wood solution WS are made to stick to magnet 8b, the scrap wood solutions which do not contain metal particles by the decantation (take a supernatant) are discharged and collected after this, and metal-

particles inclusions are also collected separately. What arranged two or more unit magnets 5000 gauss or more so that N pole and the south pole might be located in a line by turns is used so that magnetism may reach far and wide to the scrap wood solution WS as magnet 8b. Since a ceramic particle will also sediment if the aforementioned separation efficiency is influenced by the viscosity of the scrap wood solution WS and its viscosity is low, it is desirable to make solid content of the scrap wood solution WS into less than [40wt%] more than at 30wt%, for preventing sedimentation of a ceramic particle.

[0038] The centrifugal separator 9 shown in drawing 8 (B) is equipped with tumbler 9a. After putting in the scrap wood solution WS in tumbler 9a on the occasion of metal removal, predetermined time rotation of the tumbler 9a is carried out, centrifugal separation is performed, metal particles with bigger specific gravity than a ceramic particle are separated, the scrap wood solutions which do not contain metal particles are discharged and collected, and metal-particles inclusions are also collected separately. As for the aforementioned separation efficiency, it is desirable for it to be influenced by the viscosity of the scrap wood solution WS and the periphery section peripheral speed at the time of centrifugal separation, to make solid content of the scrap wood solution WS about 40 wt(s)% for preventing separation of a ceramic particle, since a ceramic particle will also be separated if viscosity is low and periphery section peripheral velocity is quick, and to make periphery section peripheral speed into about 15 m/sec.

[0039] The precipitate equipment 10 shown in drawing 8 (C) is equipped with two or more container 10a arranged in a completely different class. On the occasion of metal removal, put in and put the scrap wood solution WS 1st into container 10a, and metal particles with bigger specific gravity than a ceramic particle are settled. The supernatant of the scrap wood solution WS 1st in container 10a is put in and put 2nd into container 10a, metal particles with bigger specific gravity than a ceramic particle are settled, the scrap wood solutions with which henceforth repeats the count of need said activity, and does not contain metal particles are discharged and collected, and metal-particles inclusions are also collected separately. Since a ceramic particle will also sediment together with metal particles if the aforementioned separation efficiency influences the viscosity of the scrap wood solution WS and its solvent content is high, it is desirable to make solid content of the scrap wood solution WS more than 30wt%, for preventing sedimentation of a ceramic particle.

[0040] The cellular equipment 11 shown in drawing 8 (D) is equipped with container 11a and cellular generator 11b. On the occasion of metal removal, a surfactant is added in the scrap wood solution WS put in in container 11a, and this is made to stick to a metal-particles front face. And take out air bubbles from cellular generator 11b arranged at the container pars basilaris ossis occipitalis, and these air bubbles are made to stick to metal particles, and while surfacing metal particles and collecting metal-particles inclusions by the buoyancy of air bubbles, the scrap wood solutions which do not contain metal particles are also collected. When the scrap wood solution WS is a solvent system, as for the aforementioned surfactant, in the case of the nonionic surfactant and the drainage system, the anionic surface active agent is suitable. Moreover, in order to maintain air bubbles, it is desirable to add foam stabilizers, such as polyhydric-alcohol ester of a fatty acid. Moreover, as conditions for cellular generator 11b, that air can carry out bubbling of the air bubbles with a diameter of 2-5mm violently by the flow rate of 1 L/min is desirable. Furthermore, since metal particles will become easy to sediment conversely if the viscosity of the scrap wood solution WS is low, it is desirable to make solid content of the scrap wood solution WS more than 40wt%.

[0041] The standing decollator 12 shown in drawing 8 (E) is equipped with container 12a. On the occasion of metal removal, an acid water solution is added in the scrap wood solution WS put in in container 12a, and only metal particles are dissolved. Phase separation is carried out to the aqueous phase and a solvent phase by standing after the metal dissolution, and while discharging and collecting solvent phases (metal inclusion) from a container pars basilaris ossis occipitalis after phase separation, the scrap wood solutions which do not contain a metal are also collected. Although the nitric acid is suitable as a class of acid for dissolving only metal particles, the acid concentration which dissolves only metal particles, without dissolving a ceramic particle is prepared appropriately.

[0042] After a metal removal process performs next the quality governing (quality-governing process) of the scrap wood solution from which the metal was removed. The contents of this quality-governing process are the same as that of what was explained in the regeneration procedure of drawing 1 .

[0043] Above, a playback ceramic slurry can be obtained from the non-calcinated ceramic scrap wood containing a metallic material.

[0044] This playback ceramic slurry can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts. for example, when manufacturing a coincidence baking type stacked type ceramic condenser Coating of the aforementioned playback ceramic slurry can be carried out

on a band-like film, and a green sheet can be created. The process which prints conductive paste and forms the conductor layer for internal electrodes of a predetermined array on a green sheet as usual after this, The process which pierces a green sheet with a unit dimension, carries out the laminating of this and sticks it by pressure, The process which divides a sticking-by-pressure sheet to a chip size with equipments, such as a dicer and a slicer, The process which removes a binder from each sheep baking chip, the process which applies conductive paste to the front face of each sheep baking chip, and forms the conductor layer for external electrodes in it, The process which calcinates each sheep baking chip together with the non-calcinated conductor layer for internal electrodes and the non-calcinated conductor layer for external electrodes, and the process which forms one or more deposits in the front face of an external electrode can be carried out, and a stacked type ceramic condenser can be manufactured. Moreover, what is necessary is to apply conductive paste to the front face of each baking chip, to form the conductor layer for external electrodes, to calcinate this and just to form an external electrode, after calcinating each sheep baking chip together with the non-calcinated conductor layer for internal electrodes after said debinder process, when manufacturing a non-coincidence baking type stacked type ceramic condenser.

[0045] Moreover, it washes once [at least] by the concentration not more than solid content 30wt% using the solvent which selected the metal-particles inclusion or metal inclusion collected in the aforementioned metal removal process when a metal-particles inclusion or metal inclusions were able to be collected like said dissolution process, and a solvent can be removed and dried next, metal particles can be collected, and playback metal powder can also be obtained by performing grinding etc. if needed. This playback metal powder can be used as metal powder for conductive paste, when it can use like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts, for example, a stacked type ceramic condenser is manufactured.

[0046] When obtaining playback ceramic powder from the non-calcinated ceramic scrap wood which does not contain a [regeneration procedure shown in drawing 3 (A)] metallic material, first, non-calcinated ceramic scrap wood is dissolved with a solvent (dissolution process), and non-calcinated ceramic scrap wood is ground on the preceding paragraph story of a dissolution process if needed (grinding process). The contents of this dissolution process and the grinding process are the same as that of what was explained in the regeneration procedure of drawing 1 .

[0047] After a dissolution process performs binder removal (binder removal process) from a scrap wood solution next. Although a ceramic particle, the binder, the plasticizer, the dispersant, the solvent, etc. are already contained in the aforementioned scrap wood solution, a binder is mainly separated and removed from a scrap wood solution here.

[0048] Drawing 9 (A) - drawing 9 (C) show an usable facility at this binder removal process, respectively.

[0049] The precipitate equipment 13 shown in drawing 9 (A) is equipped with container 13a. On the occasion of binder removal, in the scrap wood solution WS put in in container 13a, it adds and said solvent is diluted so that solid content concentration may become with less than [30wt%], a ceramic particle is settled by standing, the scrap wood solution which does not contain a ceramic particle, i.e., the scrap wood solution in which the binder is dissolved, is discharged, and ceramic particle inclusions are collected.

[0050] The centrifugal separator 14 shown in drawing 9 (B) is equipped with tumbler 14a. Periphery section peripheral speed is set up so that it may become 20 or more m/sec, after putting in the scrap wood solution WS in tumbler 14a on the occasion of binder removal, in order to separate a ceramic particle completely, tumbler 14a is rotated for at least 1 hour or more, centrifugal separation is performed, a ceramic particle is separated, the scrap wood solution which does not contain a ceramic particle, i.e., the scrap wood solution in which the binder is dissolved, is discharged, and ceramic particle inclusions are collected.

[0051] The filter 15 shown in drawing 9 (C) is equipped with container 15a and filter 15b. On the occasion of binder removal, the scrap wood solution WS is put in in container 15a, the ceramic particle in a scrap wood solution is captured by the marginal filtration membrane in filter 15b, the scrap wood solution which does not contain a ceramic particle, i.e., the scrap wood solution in which the binder is dissolved, is discharged, and ceramic particle inclusions are collected. In order to capture a ceramic particle completely at this time, it is desirable to set the effective capture particle diameter of a marginal filtration membrane to 0.1 micrometers or less.

[0052] After a binder removal process performs disintegration (powder chemically-modified degree) of the collected ceramic particle inclusion next.

[0053] Drawing 10 (A) - drawing 10 (D) show an usable facility to a powder chemically-modified [this] degree, respectively.

[0054] The heating furnace 16 shown in drawing 10 (A) is for heating the collected ceramic particle

inclusion and making it dry. Since the solvent, the binder of a minute amount, etc. have adhered to the collected ceramic particle inclusion WSa, processing which heats and removes this at the temperature beyond the pyrolysis point of a solvent and a binder (300-600 degrees C) is performed in advance.
[0055] The grinding equipment 17 shown in drawing 10 (B) is equipped with container 17a, agitator 17b, and grinding roller 17c. On the occasion of disintegration, agitator 17b and grinding roller 17c are rotated, supplying the ceramic particle WSb after desiccation in container 17a, and disintegration (refer to sign PO) of the ceramic particle WSb is broken and carried out.
[0056] The grinding equipment 18 shown in drawing 10 (C) is equipped with container 18a and grinder 18b of a rise and fall system. On the occasion of disintegration, the ceramic particle WSb after desiccation is put in in container 18a, and disintegration is broken and carried out by grinder 18b which goes up and down this.
[0057] The grinding equipment 19 shown in drawing 10 (D) is equipped with container 19a and grinder 19b of a rotating type. On the occasion of disintegration, the ceramic particle WSb after desiccation is put in in container 19a, and disintegration of this is broken and carried out by grinder 19b.
[0058] Above, playback ceramic powder can be obtained from the non-calcinated ceramic scrap wood which does not contain a metallic material.
[0059] This playback ceramic powder can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts. for example, when manufacturing a coincidence baking type stacked type ceramic condenser The ceramic slurry for green sheets can be prepared using the aforementioned playback ceramic powder. The process which carries out coating of the ceramic slurry on a band-like film as usual after this, and creates a green sheet, The process which prints conductive paste and forms the conductor layer for internal electrodes of a predetermined array on a green sheet, The process which pierces a green sheet with a unit dimension, carries out the laminating of this and sticks it by pressure, The process which divides a sticking-by-pressure sheet to a chip size with equipments, such as a dicer and a slicer, The process which removes a binder from each sheep baking chip, the process which applies conductive paste to the front face of each sheep baking chip, and forms the conductor layer for external electrodes in it, The process which calcinates each sheep baking chip together with the non-calcinated conductor layer for internal electrodes and the non-calcinated conductor layer for external electrodes, and the process which forms one or more deposits in the front face of an external electrode can be carried out, and a stacked type ceramic condenser can be manufactured. Moreover, what is necessary is to apply conductive paste to the front face of each baking chip, to form the conductor layer for external electrodes, to calcinate this and just to form an external electrode, after calcinating each sheep baking chip together with the non-calcinated conductor layer for internal electrodes after said debinder process, when manufacturing a non-coincidence baking type stacked type ceramic condenser.
[0060] Moreover, in the aforementioned binder removal process, a playback binder can also be obtained by drying the collected binder inclusion and grinding if needed, when a binder inclusion is recoverable. This playback binder can be used as a binder for conductive paste, when it can use like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts, for example, a stacked type ceramic condenser is manufactured.
[0061] When obtaining playback ceramic powder from the non-calcinated ceramic scrap wood which does not contain a [regeneration procedure shown in drawing 3 (B)] metallic material, binder removal (binder removal process) from non-calcinated ceramic scrap wood is performed first. Although a ceramic particle, the binder, the plasticizer, the dispersant, the solvent, etc. are already contained in the aforementioned non-calcinated ceramic scrap wood, a binder is mainly separated and removed from non-calcinated ceramic scrap wood here.
[0062] Although not shown in a drawing, as an approach of removing a binder, non-calcinated ceramic scrap wood is heated at the temperature beyond the pyrolysis point of a binder (300-600 degrees C), and a pyrolysis removes a content binder. The pyrolysis also of the dispersant and solvent which are contained in non-calcinated ceramic scrap wood by this heat treatment is carried out similarly, and they may be removed.

[0063] After a binder removal process performs next disintegration (powder chemically-modified degree) of the non-calcinated ceramic scrap wood from which the binder was removed. The powder chemically-modified [this] degree is the same as that of what was explained in the regeneration procedure of drawing 3 (A).
[0064] Above, playback ceramic powder can be obtained from the non-calcinated ceramic scrap wood which does not contain a metallic material.

[0065] This playback ceramic powder can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts. for example, when manufacturing a coincidence baking type stacked type ceramic condenser The ceramic slurry for green sheets can be prepared using the aforementioned playback ceramic powder. The process which carries out coating of the ceramic slurry on a band-like film as usual after this, and creates a green sheet, The process which prints conductive paste and forms the conductor layer for internal electrodes of a predetermined array on a green sheet, The process which pierces a green sheet with a unit dimension, carries out the laminating of this and sticks it by pressure, The process which divides a sticking-by-pressure sheet to a chip size with equipments, such as a dicer and a slicer, The process which removes a binder from each sheep baking chip, the process which applies conductive paste to the front face of each sheep baking chip, and forms the conductor layer for external electrodes in it, The process which calcinates each sheep baking chip together with the non-calcinated conductor layer for internal electrodes and the non-calcinated conductor layer for external electrodes, and the process which forms one or more deposits in the front face of an external electrode can be carried out, and a stacked type ceramic condenser can be manufactured. Moreover, what is necessary is to apply conductive paste to the front face of each baking chip, to form the conductor layer for external electrodes, to calcinate this and just to form an external electrode, after calcinating each sheep baking chip together with the non-calcinated conductor layer for internal electrodes after said debinder process, when manufacturing a non-coincidence baking type stacked type ceramic condenser.

[0066] When obtaining playback ceramic powder from the non-calcinated ceramic scrap wood containing a [regeneration procedure shown in drawing 4] metallic material, first, non-calcinated ceramic scrap wood is dissolved with a solvent (dissolution process), and non-calcinated ceramic scrap wood is ground on the preceding paragraph story of a dissolution process if needed (grinding process). The contents of this dissolution process and the grinding process are the same as that of what was explained in the regeneration procedure of drawing 1 .

[0067] After a dissolution process performs metal removal (metal removal process) from a scrap wood solution next. The contents of this metal removal process are the same as that of what was explained in the regeneration procedure of drawing 2 .

[0068] After a metal removal process performs binder removal (binder removal process) from a scrap wood solution next. The contents of this binder removal process are the same as that of what was explained in the regeneration procedure of drawing 3 (A). Moreover, dry a scrap wood solution, it is made to solidify as an approach of removing a binder, this is heated at the temperature beyond the pyrolysis point of a binder (300-600 degrees C), and how a pyrolysis removes a content binder can be used.

[0069] After a binder removal process performs disintegration (powder chemically-modified degree) of the collected ceramic particle inclusion next. The contents of the powder chemically-modified [this] degree are the same as that of what was explained in the regeneration procedure of drawing 3 (A).

[0070] Above, playback ceramic powder can be obtained from the non-calcinated ceramic scrap wood containing a metallic material.

[0071] This playback ceramic powder can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts. for example, when manufacturing a coincidence baking type stacked type ceramic condenser The ceramic slurry for green sheets can be prepared using the aforementioned playback ceramic powder. The process which carries out coating of the ceramic slurry on a band-like film as usual after this, and creates a green sheet, The process which prints conductive paste and forms the conductor layer for internal electrodes of a predetermined array on a green sheet, The process which pierces a green sheet with a unit dimension, carries out the laminating of this and sticks it by pressure, The process which divides a sticking-by-pressure sheet to a chip size with equipments, such as a dicer and a slicer, The process which removes a binder from each sheep baking chip, the process which applies conductive paste to the front face of each sheep baking chip, and forms the conductor layer for external electrodes in it, The process which calcinates each sheep baking chip together with the non-calcinated conductor layer for internal electrodes and the non-calcinated conductor layer for external electrodes, and the process which forms one or more deposits in the front face of an external electrode can be carried out, and a stacked type ceramic condenser can be manufactured. Moreover, what is necessary is to apply conductive paste to the front face of each baking chip, to form the conductor layer for external electrodes, to calcinate this and just to form an external electrode, after calcinating each sheep baking chip together with the non-calcinated conductor layer for internal electrodes after said debinder process, when manufacturing a non-coincidence baking type stacked type ceramic condenser.

[0072] Moreover, it washes once [at least] by the concentration not more than solid content 30wt% using

the solvent which selected the metal-particles inclusion or metal inclusion collected in the aforementioned metal removal process when a metal-particles inclusion or metal inclusions were able to be collected like said dissolution process, and a solvent can be removed and dried next, metal particles can be collected, and playback metal powder can also be obtained by performing grinding etc. if needed. This playback metal powder can be used as metal powder for conductive paste, when it can use like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts, for example, a stacked type ceramic condenser is manufactured.

[0073] Furthermore, in the aforementioned binder removal process, a playback binder can also be obtained by drying the collected binder inclusion and grinding if needed, when a binder inclusion is recoverable. This playback binder can be used as a binder for conductive paste, when it can use like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts, for example, a stacked type ceramic condenser is manufactured.

[0074] Thus, the non-calcinated ceramic scrap wood produced in the manufacture process of a stacked type ceramic condenser can be reproduced, a playback ceramic slurry and playback ceramic powder can be generated, and these can be used like a non-reproducing thing as an ingredient at the time of manufacturing a stacked type ceramic condenser. While the cost burden which scrap wood disposal takes is mitigable by this, reduction of the manufacturing cost of ceramic electronic parts etc. can be aimed at.

[0075] Moreover, since it is also possible to dissociate suitably, to collect metal particles and the binders which are contained in a scrap wood solution, and to use these as playback metal powder or a playback binder, reuse of the non-calcinated ceramic scrap wood is carried out more effectively, and it can contribute to mitigation of a cost burden, reduction of the manufacturing cost of ceramic electronic parts, etc. which the aforementioned scrap wood disposal takes.

[0076] In addition, although the case where reuse of the non-calcinated ceramic scrap wood produced in the manufacture process of a stacked type ceramic condenser was carried out was mentioned as the example in the above-mentioned explanation The ceramic electronic parts of the other type manufactured using the same process not only as a stacked type ceramic condenser but a stacked type ceramic condenser, or an approximate process, The non-calcinated ceramic scrap wood generated in manufacture processes, such as a laminating ceramic condenser array, a laminating ceramic inductor, and a laminating ceramic LC filter, is reproduced with the same procedure as the above. For example, a playback ceramic slurry and playback ceramic powder, Furthermore playback metal powder, a playback binder, etc. can be obtained, and these can be used like a non-reproducing thing as an ingredient at the time of manufacturing ceramic electronic parts.

[0077]

[Effect of the Invention] As explained in full detail above, according to this invention, the playback ceramic slurry which can contribute to mitigation of the cost burden which scrap wood disposal takes, reduction of the manufacturing cost of ceramic electronic parts, etc. and its manufacture approach, playback ceramic powder and its manufacture approach, and ceramic electronic parts and its manufacture approach can be offered.

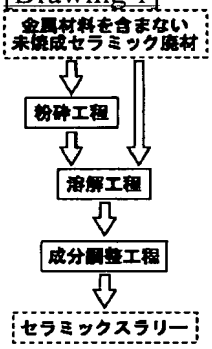
[Translation done.]

* NOTICES *

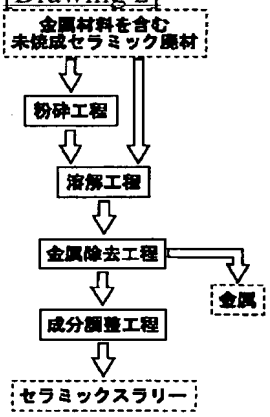
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

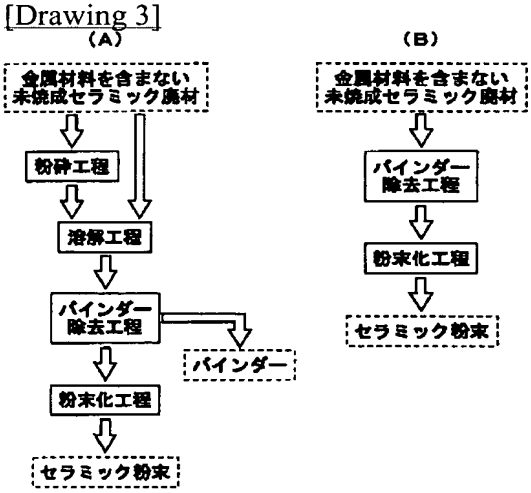
[Drawing 1]



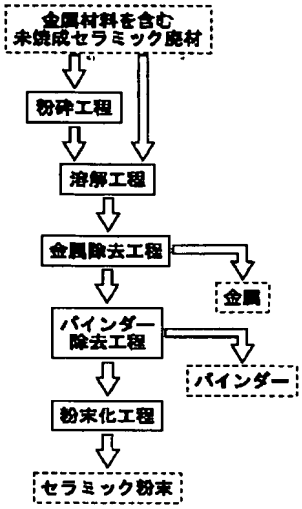
[Drawing 2]



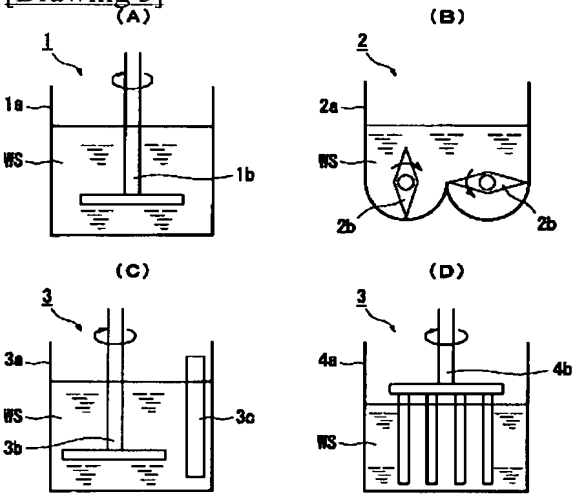
[Drawing 3]



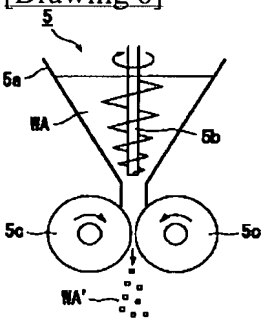
[Drawing 4]



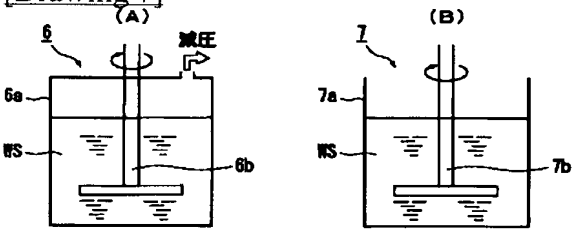
[Drawing 5]



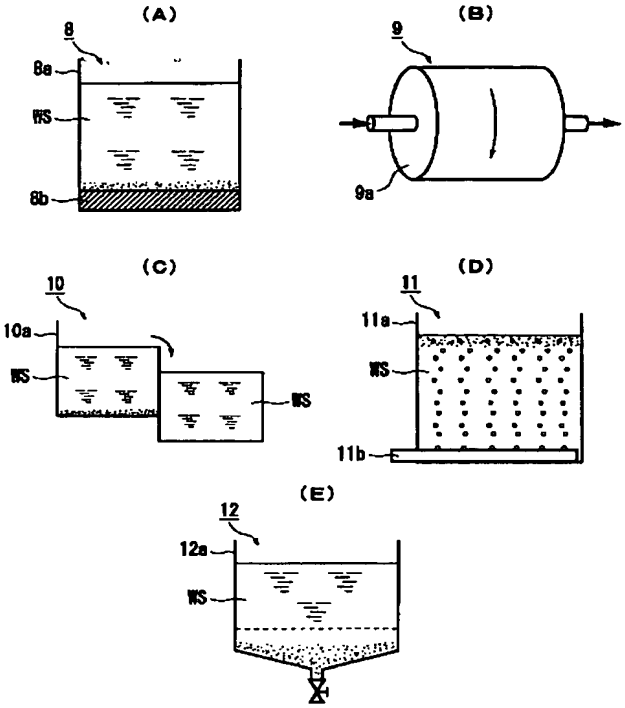
[Drawing 6]



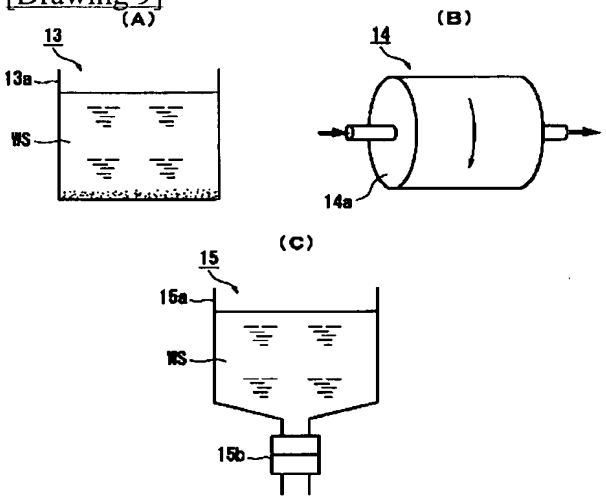
[Drawing 7]



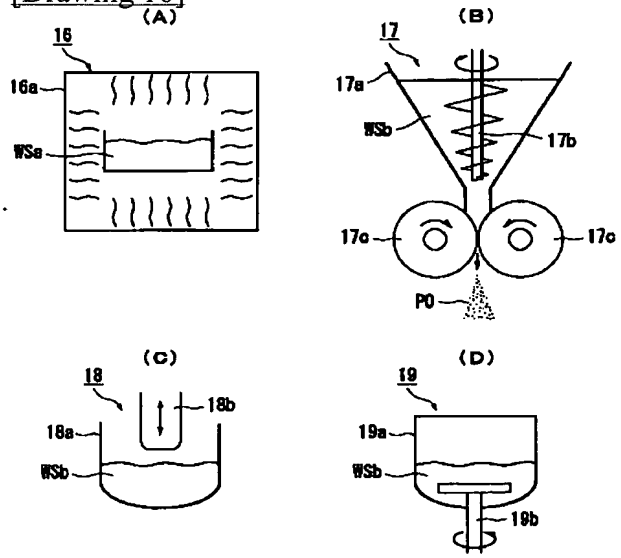
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]